

Appendix C

REPORT**Delburn Wind Farm, Gippsland, Victoria***Desktop Assessment of Potential Geotechnical, Contaminated Land and Hydrogeological Impacts at Proposed Terminal Stations*

Submitted to:

Delburn Wind Farm Pty. Ltd.

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Executive Summary

Golder Associates Pty Ltd has been engaged by Delburn Wind Farm Pty. Ltd. (an OSMI Australia Pty Ltd Company) (OSMI) to undertake an assessment of potential geotechnical, contaminated land and hydrogeological impacts associated with the a terminal station facility for the proposed Delburn Wind Farm (DWF) located in the vicinity of Delburn, about 5 km to south east of Moe in Victoria. Two location options are currently proposed for the terminal station, to the north east of the proposed DWF adjacent to and either side of Varys Track and immediately south of an existing 220 kV transmission line into which the terminal station will be connected, as indicated in Figure 1.

Relevant clauses within the state and local government planning policy framework that relate to potential geotechnical, contaminated land and hydrogeological impacts have been identified. These clauses generally relate to impacts of the proposed development to groundwater and surface water, landslide, erosion, acid sulfate soils, salinity and impacts to stone and coal resources. Impacts associated with each of these have been assessed based on a desktop study.

Construction of the proposed terminal station is expected to involve minor earthworks to level areas, the construction of pavements and laydown areas, shallow excavation for footings and drainage.

Both site options are currently used for forestry purposes. They are relatively flat with minor shallow drainage courses which drain the site east towards the Morwell River.

Published information indicates that the proposed terminal station sites are both underlain by Pliocene to Miocene age dense sands and hard clays of the Latrobe Valley Group. The soils of the Latrobe Valley Group have minor susceptibility to erosion. Notwithstanding this, given the relatively flat slopes, it is expected that erosion through construction could be managed via normal construction practices including wetting of soil to suppress dust, temporary silt barriers and drains. In the permanent condition, drainage could be provided to collect water runoff from pavements and direct it to a suitable point of discharge.

Neither of the proposed terminal station development locations are expected to encounter or disturb soils that are prone to salinity or that are potential acid sulfate soils. Overall, the potential geotechnical, hydrogeological and contaminated land impacts associated with the proposed terminal station developments are either negligible or are expected to be manageable within the requirements of the relevant planning scheme using conventional construction and operation techniques.

There are no known stone resources underlying the proposed terminal station, however a brown coal resource is located under the site between depths of 19 m and 38 m.

Additional investigation will be required to provide information to inform detailed design of the proposed terminal station. This information should be reviewed to confirm the indications of the desktop study on which this conclusion is based. If information is obtained which is contrary to the expectations arising from the desktop study, there may be a requirement to introduce additional mitigation measures. However, we expect that any measures required would comprise design and construction which is typical for developments of this type.

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FIGURES (attached)

Figure 1 – Site layout showing proposed terminal station options

Figure 2 – Geological Plan

Figure 3 – Depth to Groundwater and Registered Wells

Figure 4 – Groundwater Dependent Ecosystems

APPENDICES

APPENDIX A

Results of Desktop Study

APPENDIX B

Historical Aerial Photographs

APPENDIX C

Important Information Relating to This Report

1.0 ENGAGEMENT

Delburn Wind Farm Pty. Ltd. (an OSMI Australia Pty. Ltd. Company) (OSMI) has engaged Golder Associates Pty Ltd (Golder) to undertake an assessment of potential geotechnical, contaminated land and hydrogeological impacts associated with terminal stations proposed as part of the Delburn Wind Farm (DWF) in the Gippsland region of Victoria. This report specifically addresses impacts relevant to state and local government planning policy frameworks in the areas of geotechnical, contaminated land and hydrogeology. Impacts considered in this report include those associated with erosion, landslip, changes to surface water runoff, groundwater impacts, salinity, natural hazards and impact to known resources.

2.0 BACKGROUND

2.1 Site description

The proposed terminal station is to be located to the north east of the proposed DWF adjacent to an existing 220 kV transmission line. Two location options are proposed, one on either side of Varys Track as indicated in Figure 1. Each of the proposed terminal station locations has a plan area of about 5 hectares, including construction laydown areas. The proposed paved areas on which the main terminal station infrastructure is located has an area of about 1.7 hectares. The site is generally flat with a gentle slope towards the east.

The terminal station locations are currently used for forestry and comprise a mixture of vegetated and recently cleared forestry areas with some adjacent open paddocks. There are several minor water courses that pass through the proposed terminal locations. These are tributaries to the Morwell River which runs to the east of the site.

2.2 Proposed Terminal Station

Plate 1 and Plate 2 indicate the proposed layouts of Option A and Option B of the proposed terminal station as communicated by OSMI. Based on these plans, we understand that the proposed terminal station development is expected to comprise the following elements:

- Minor earthworks to level the site for laydown areas and to prepare pavement subgrade.
- The construction of pavements.
- Surface drainage on and around the pavement and direction of the drainage to a discharge point.
- Shallow footings to support terminal station structures.
- Deep footings to support transmission lines and strain poles.
- Buried services connecting the WTG to the terminal station.

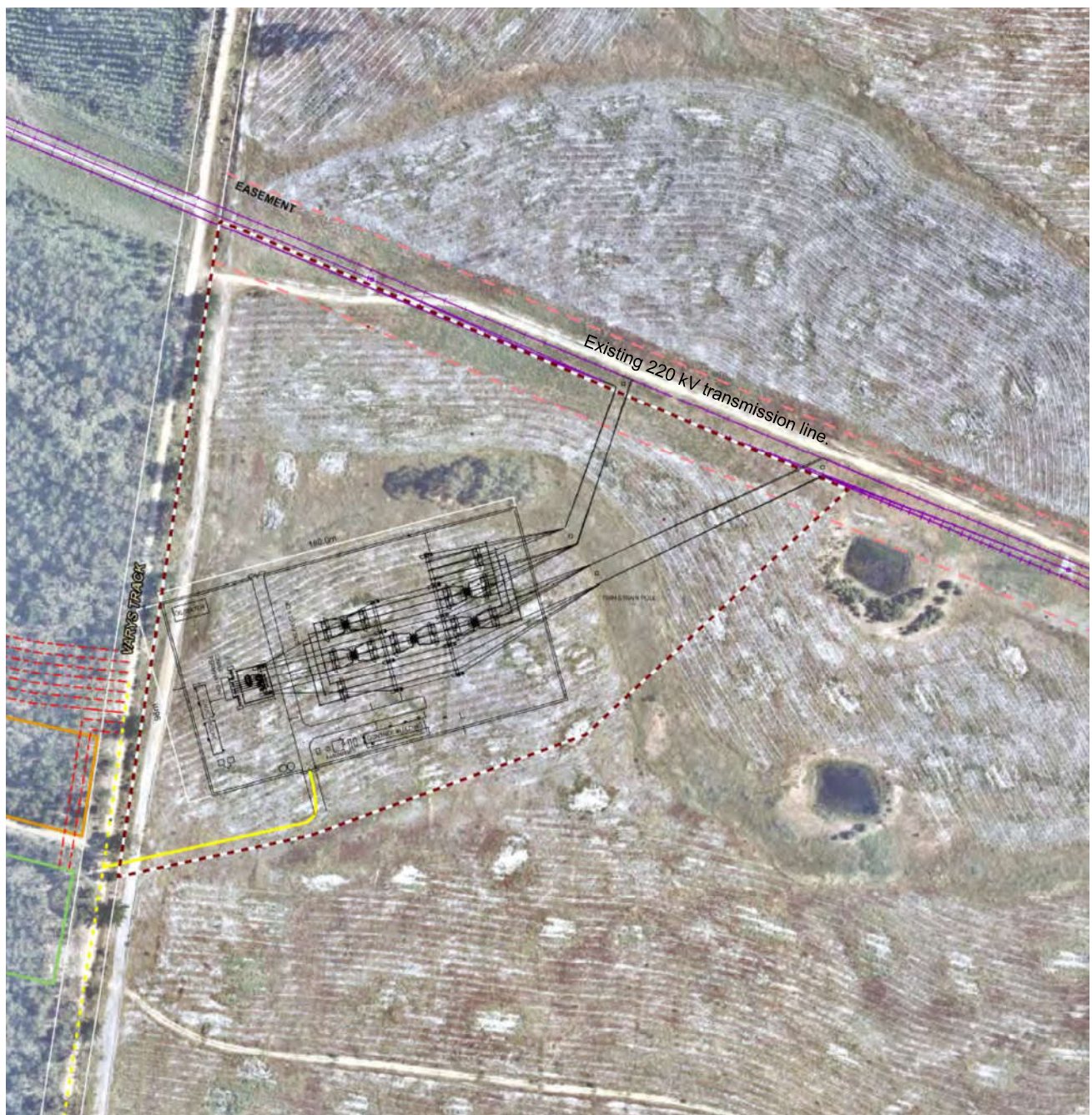


Plate 1: Proposed DWF Terminal Station, Option A

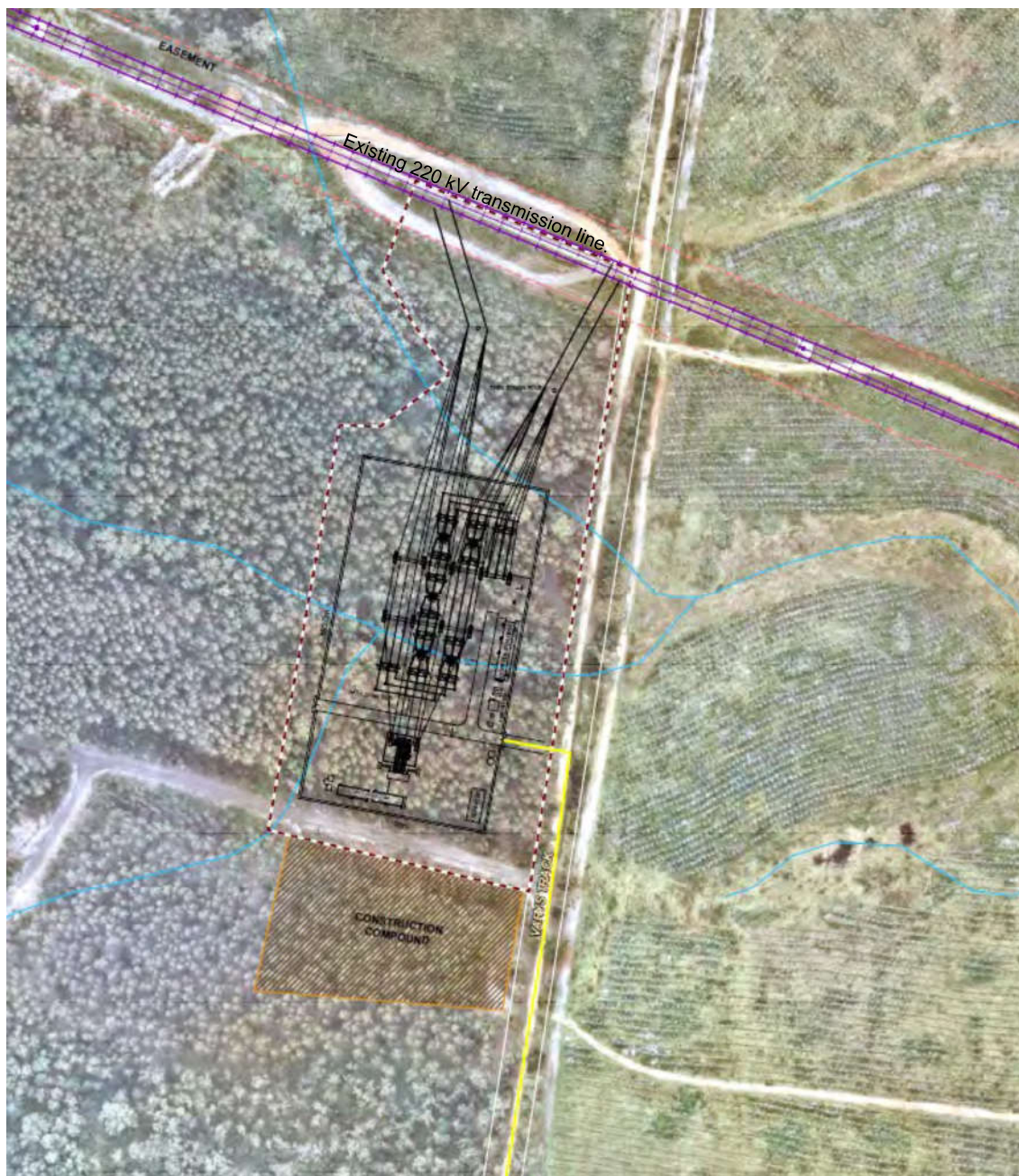


Plate 2: Proposed DWF Terminal Station, Option B

3.0 PLANNING POLICY FRAMEWORK

We have been provided with a memorandum prepared by Debra Butcher Consulting (DBC) (dated April 28, 2020) which sets out planning controls that are expected to apply to the broader DWF along with planning advice specific to the terminal station. The following extracts from the DBC report and advice summarise planning controls relevant to geotechnical, hydrogeological and contaminated land aspects of the proposed terminal station at both state and local government level.

3.1 State level

The proposed terminal station will be used to transmit and distribute energy generated by the Delburn Wind Farm. A terminal station sits within definition of a 'utility installation' in the Latrobe Planning Scheme. It is defined as a separate land use to that of the wind farm, notwithstanding the fact that it transmits energy from the wind farm to the electricity grid.

The Minister for Planning is the responsible authority for all new planning permit applications for renewable energy facilities that are 1 megawatt or greater as well as associated utility installations. Accordingly, the Minister for Planning is the responsible authority for Delburn Terminal Station application.

Key state level policies of the planning scheme that are of relevance to geotechnical, hydrogeological and contaminated land aspects include:

- Clause 12.03-1S River corridors, waterways, lakes and wetlands. The need to protect the environmental, cultural and landscape values of all water bodies and wetlands is recognised by this clause.
- Clause 13.01-1S Natural hazards and climate change. Seeks to identify at risk areas and consider those risks in planning and management decision making processes.
- Clause 13.04-2S Erosion and landslip. Seeks to prevent inappropriate development in unstable areas or areas prone to erosion.
- Clause 13.04-3S Salinity. Seeks to minimise the impact of salinity and rising water tables on land uses, buildings and infrastructure in rural and urban areas and areas of environmental significance.
- Clause 14.02-1S Catchment planning and management. Seeks to assist the protection and restoration of catchments, water bodies, groundwater and the marine environment including ensuring that development at or near waterways protects the environmental qualities of waterways and their instream uses. This includes the provision of appropriate setbacks to waterways.
- Clause 14.02-2S Water Quality. Seeks to ensure that land use activities are sited and designed to minimise discharge to waterways and to protect the quality of surface water and groundwater.
- Clause 14.03-1S Resource exploration and extraction. Amongst a range of strategies this clause seeks to protect the brown coal resource in Central Gippsland by ensuring that changes in use and development of land overlying coal resources do not compromise the winning or processing of coal.
- Clause 14.03-1R Resource exploration and extraction. This clause seeks to protect the Gippsland brown coal resource and associated buffer areas via a range of strategies including ensuring that development in coal resource areas does not compromise the existing or future use of the resource.

3.2 Local level

The proposed terminal station locations are within the municipality of Latrobe City. Relevant clauses from the Latrobe City planning policy framework which are applicable to geotechnical, hydrogeological and contaminated land issues are set out below.

- Clause 21.05-17 Stone resources. Seeks to protect significant stone resources to ensure adequate future supplies. The clause refers to protecting areas as required by the Latrobe Area Extractive Industry Interest Areas Strategy 1999 and seeks to protect extractive industry sites by separating incompatible land uses.
- Clause 21.05-3 Water. This clause seeks to protect and improve waterway health including through the provision of buffers to waterways and retention of riparian land.
- Clause 21.05-8 Coal Resources. This Clause identifies the significance of the brown coal resource in the Latrobe Valley and its role in supplying over 90 per cent of Victoria's electricity. Included as an objective is to ensure that new development is not undertaken in such a way as to compromise the effective and efficient use of existing or future infrastructure or resources such as coal resources, timber production and high-quality agricultural land. The proposed terminal stations are located within an area designated as 'Category A coal area', which indicates development of the resource is possible within 10 to 30 years.

3.3 Summary of planning provisions assessed in this report

Based on the planning provisions set out above, this report discusses the potential impacts of the proposed terminal station associated with:

- Erosion and landslip.
- Surface water including catchments, rivers and waterways.
- Groundwater.
- Stone resources.
- Coal resources.
- Natural hazards.
- Dry land salinity.
- Soil and groundwater contamination.
- Acid sulfate soils.

4.0 AIMS OF THE ASSESSMENT

In accordance with our understanding of the state and local level planning provisions, the aims of the assessment are to provide information relevant to the requirements of the applicable planning scheme as follows:

- Assess the surface topography, surrounding land use and likely subsurface conditions at the proposed terminal station sites.

- Identify potential impacts on erosion and landslip and where appropriate indicate means by which potential impacts could be mitigated.
- Identify potential impacts on surface water, including catchments, rivers and waterways and where appropriate indicate means by which potential impacts could be mitigated.
- Identify potential impacts on groundwater, and where appropriate indicate means by which potential impacts could be mitigated.
- Identify the potential for the project to impact or be impacted by contaminated land, salinity and acid sulfate soils.
- Identify the potential for the project to impact or be impacted by natural hazards, including earthquake and landslide.
- Identify potential impacts on stone resources.
- Identify potential impacts on coal resources.

Please note that consideration of cultural heritage and biodiversity protection are outside the scope of this assessment.

5.0 METHODOLOGY

5.1 General

The assessment comprised a desktop study and site walkover survey which covered the broader DWF area. This report specifically covers the proposed terminal station. Relevant aspects of the desktop study are set out in Appendix A. The information gathered in the desk study is called upon to inform the impact assessments described in Section 6.0.

5.2 Documents reviewed

As part of the desktop study relevant aspects of the following documents were reviewed.

5.2.1 Historical information

- Historical aerial photographs of the site from 1945, 1965 and the 1980s. The historical photographs reviewed are presented in Appendix B.

5.2.2 Environmental Protection Authority database

- EPA Environmental Audit database.
- EPA Priority Sites Register.
- Post Closure Pollution Abatement Notices.
- Victorian Landfill Register.

5.2.3 Published geological information

- Geological Survey of Victoria (GSV) 1:250,000 scale 'Warragul' mapsheet.
- CSIRO – ASRIS Acid Sulfate Soils Probability Maps.
- Victorian Salinity Provinces, Victorian Department of Environment and Primary Industries.
- Department of Primary Industries, Victorian Coal, A 2006 Inventory of Resources, 31 August 2007.

We have also reviewed information on the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) 'Geovic' and the Visualising Victoria's Groundwater (VVG) websites.

6.0 IMPACT ASSESSMENT

Based on the information compiled from the desk study, the following discusses the potential impacts associated with the proposed terminal station along with measures that may be required to manage impacts and further investigation that is expected to be required to better understand the potential impacts.

6.1 Erosion and landslip

6.1.1 Summary of findings

Figure 2 presents the geological map for the site and indicates the site to be underlain by the Latrobe Valley Group. Whilst there is landslide susceptibility in the broader area of the proposed DWF, landslide instability is associated with the Thorpdale Volcanics unit, which occurs to the west of the proposed terminal station sites.

The site is relatively flat and furthermore, is underlain by geological materials that are not typically prone to landslide.

The site walkover over the broader DWF did not reveal significant evidence for erosion and where erosion was observed it comprised minor eroded gullies on steeper slopes than are not present at the proposed terminal station sites. Given the shallow slope angles at the proposed terminal station sites, and based on comparison with erosion susceptibility elsewhere on the site, the susceptibility of the site to erosion is assessed to be very low.

6.1.2 Project implications

Based on the shallow slope angles and low prevalence to erosion assessed, the susceptibility of the proposed terminal station site to erosion is assessed to be low. We expect that erosion can be managed through normal construction and slope maintenance processes implemented in accordance with the following guidelines:

- EPA Victoria Publication – Construction Techniques for Sediment Pollution Control, May 1991.
- Environment Guidelines for Major Construction Sites (EPA Victoria, February 1996).
- Control of Erosion on Construction sites, Soil Conservation Authority.

Relevant measures to manage erosion are likely to include sheeting of unsealed roads with material of low dispersivity (crushed rock), temporary and permanent drainage, temporary and permanent silt barriers where there is a risk of erosion and sediment runoff from exposed soils, mulching and revegetation of areas temporarily cleared for construction purposes.

6.2 Surface water including catchments, rivers and waterways

6.2.1 Summary of findings

The GeoVic website indicates that the site is not located within a declared water supply catchment area and the proposed terminal station is not expected to impact a declared water supply catchment.

The Option B site will likely directly impact a minor tributary to the Morwell River, which subject to detailed hydrological studies will likely require this drainage course to either be piped under or diverted around the terminal station. The terminal station at the Option A site could be oriented in such a way that there is no direct impact upon the tributary.

6.2.2 Project implications

If uncontrolled erosion and sediment run off is allowed to occur at the proposed terminal station, it is conceivable that sediment run off could impact upon surface water. However, with normal erosion control measures implemented in accordance with the guidelines referenced in Section 6.1.2 including capping access roads and hardstand areas, the provision of drainage, temporary dust suppression and silt barriers during construction, we expect that erosion can be controlled and sediment retained such that the impact to surface water courses is negligible.

If the Option B site is to be pursued, a site specific study to assess hydrological and ecological impacts associated with diverting or piping the water course on this site will be required.

6.3 Groundwater

6.3.1 Summary of findings

Figure 3 presents the estimated depth to groundwater level expected at the proposed terminal station, the depth to groundwater is expected to generally be more than 20 m below ground surface. It is highly unlikely for there to be a requirement for foundations to extend to these depths and if they do, that they would have an impact on groundwater.

Figure 4 presents groundwater dependent ecosystems, noting that the Option B site could directly impact a terrestrial low potential groundwater dependent ecosystem.

6.3.2 Project implications

The works for the proposed terminal station are not expected to encounter groundwater and therefore not expected to have any influence on groundwater levels or quality. However, if the Option B site is pursued, site specific ecological studies may be required to assess impact on the groundwater dependent ecosystem mapped at this location, in particular if the water course here is piped or diverted and the groundwater supply to the ecosystem is altered.

6.4 Stone resources

6.4.1 Summary of findings

Boreholes drilled on the site by the SEC in 1956 and 1980 indicate that to 40 m depth, the site is underlain by predominantly clay soils and coal. These materials are not suitable as stone resources.

6.4.2 Implications for project

There are not expected to be any impacts to the project associated with potential stone resources underlying the terminal station.

6.5 Coal Resources

6.5.1 Summary of findings

The site is underlain by coal resources. Based on State Electricity Commission (SEC) boreholes drilled in 1956 and 1980 and the 2006 inventory of coal resources, the site is underlain by the Morwell 1 seam at a depths of between about 19 m and 38 m below ground level. Borehole 322502 is located about 100 m to the west of the Option B site and did not encounter coal suggesting the coal seam thins towards the west of Site 2. According to the Latrobe City planning scheme, these coal resources fall under a Coal resource A category, meaning that for planning purposes, it is assumed they could be mined within a 10 to 30 year time frame.

6.5.2 Implications for project

The site of the proposed terminal stations will conflict with coal resources. We understand that this conflict will need to be considered as part of the planning application process. Notwithstanding this, it is noted that the overburden over the coal at 19 m is relatively thick and the coal seam relatively thin.

6.6 Natural hazards

6.6.1 Summary of findings

The only natural hazard identified from the geotechnical desk study that could feasibly impact upon the site of the proposed terminal station is earthquake. The Thorpdale area has a history of low magnitude earthquakes with earthquakes up to Magnitude 5.4 having occurred within about 12 km of the proposed terminal station site based on indications of the GeoVic website.

6.6.2 Implications for project

The effects on structures of earthquakes of this magnitude are typically mitigated through engineering design using the methods set out in AS1170.4 – 2007 'Structural design actions Part 4: Earthquake actions in Australia'.

6.7 Dry land salinity

6.7.1 Summary of findings

An increase in the salt content within soils (dry land salinity) affects some areas of Australia. It occurs as a result of groundwater rising to near surface levels. Some soils within Australia have a naturally high salt content and groundwater rise can leach salts from within the soil, depositing them at higher levels in the soil profile causing impact to vegetation. Evaporation of groundwater can occur where groundwater is shallow or discharging, which can concentrate salt in the soil if the groundwater is saline. Groundwater rise can be triggered by the removal of vegetation and typically affects areas of Australia that have been cleared for agricultural purposes.

The proposed terminal station location has a very low susceptibility to dry land salinity for the following reasons:

- The Latrobe Valley Group which underlies the site is derived from fresh water sediment deposition and therefore expected to have a low sodium and potassium content. Soils derived from deposition in saline water have a much higher susceptibility, however soils with this origin are not expected to underlie the proposed terminal station.
- Development of the site does not involve widespread vegetation clearance of the type that is known to trigger groundwater rise.
- Measured dissolved chloride concentrations within the nearest groundwater well to the site is 117 mg/L, a level which is consistent with fresh water.
- Groundwater underlying the site is estimated to be more than 20 m below the ground surface.
- The proposed terminal station is on the periphery of but not within a designated salinity province, with the nearest salinity province that of the Moe Basin as indicated in Plate 3. Furthermore, based on the Victorian Department of Environment and Primary Industries, there are no recorded instances of land salinity within the Moe Basin Salinity Province.
- No Salinity Management Overlay applies to the site under the planning scheme.

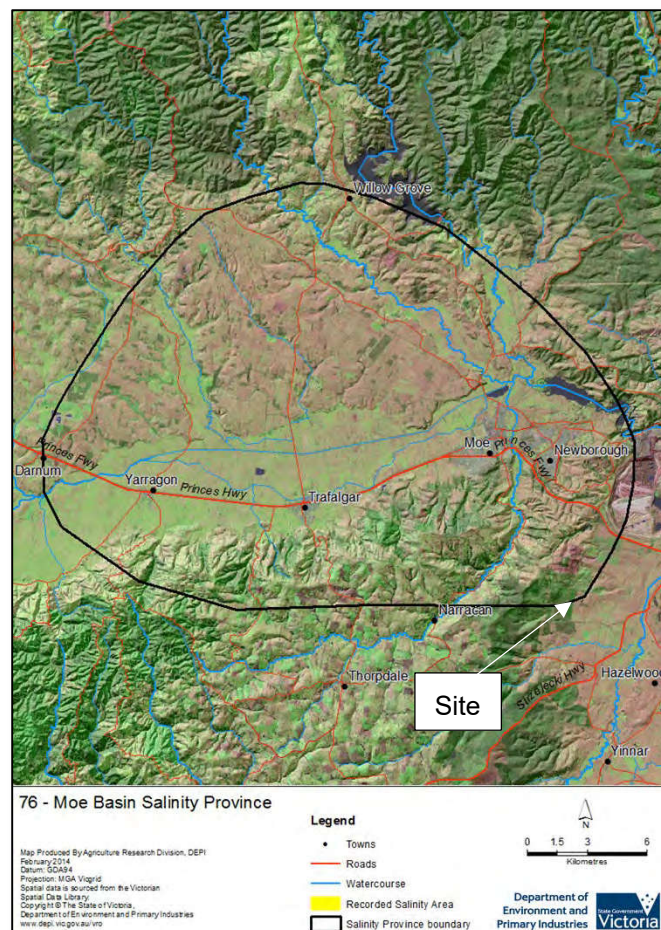


Plate 3: Moe Basin Salinity Province - Victorian Department of Environment and Primary Industries

6.7.2 Implications for project

The project is not expected to be impacted by or to have an impact upon dry land salinity.

6.8 Soil and groundwater contamination

6.8.1 Summary of findings

The review of historical information has indicated that the risk of potential contamination of soil is likely to be low.

6.8.2 Implications for project

Assuming the adoption of good construction practices such as erosion protection of exposed cut and fill batter slopes, drainage controls and the implementation of silt fences where required, erosion of cut and fill batters is not considered to be a significant issue for the proposed terminal station taking into account the shallow site slopes. Consequently, the potential for contaminant migration, if contaminants are present at all is very low.

In the unlikely event that contaminated soil is encountered, it may need to be disposed of off-site at a facility licensed to accept the waste.

6.9 Acid sulfate soils

6.9.1 Summary of findings

The CSIRO Acid Sulfate Soils Probability map as shown in Plate 4 indicates an “extremely low probability of occurrence” at the site of the proposed terminal station.

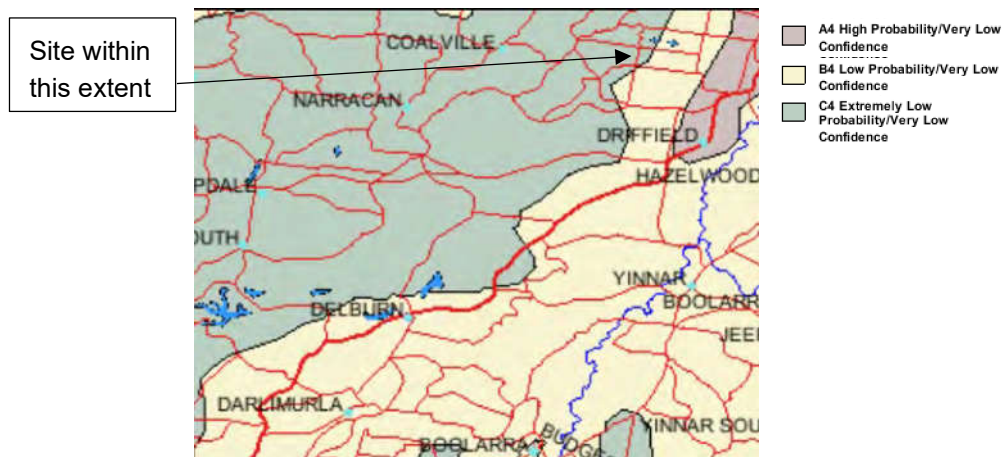


Plate 4: Acid Sulfate Spoils Probability (CSIRO Australian Soil Resource Information System)

6.9.2 Implications for project

No potential acid sulfate soils are expected to be disturbed by the construction of the proposed terminal station.

6.10 Future investigation

We recommend that future investigation for the proposed terminal station development include an array of boreholes and test pits across the areas where pavement and shallow foundations are proposed. Boreholes could be advanced to about 5 m to 10 m depth, or sufficient to provide information to inform foundation design. Test pits to 1.5 m depth could be undertaken across proposed pavements in order to obtain information to inform pavement design. Information obtained from boreholes and test pits could also be used to further assess the susceptibility of soils to erosion.

Ecological and hydrogeological studies may be required if the Option B site is selected or if there is a requirement to divert or pipe surface water.

7.0 SUMMARY AND CONCLUSIONS

The proposed terminal station development is expected to involve minor levelling works, and temporary excavation for footings and trenches. Sealed and unsealed pavements and hardstands are also expected to be required. The impact from the development associated with geotechnical, contaminated land and hydrogeological considerations is assessed to be very low for the following reasons:

- Infrastructure is not proposed for construction in areas that are susceptible to natural hazards including landslides.
- Excavation is not expected to extend to sufficient depth such that groundwater is encountered.
- The soils have a low susceptibility to erosion and the site has a shallow gradient. Erosion of exposed soils during construction is expected to be managed using standard construction techniques including dust suppression, silt fences and temporary drainage. Long term, crushed rock surfacing or pavement will be required on roads and hardstands to provide erosion protection. Provided erosion controls are in place and erosion is appropriately managed the impact to surface water is expected to be negligible.
- The area is not susceptible to salinity based on the groundwater level, quality and geological conditions.
- There are no potential acid sulfate soils expected to be encountered at locations where infrastructure is proposed.
- No contaminated land has been identified at the proposed development locations. Although there is some potential for contamination associated with past farming and logging activities, it is expected that contaminated land could be managed through off-site disposal to a facility licensed to receive the waste.
- The site is underlain between depths of about 19 m and 38 m by coal resources.

Based on the planning provisions set out in Section 3.0, the potential impacts of the proposed terminal station and impacts to the proposed terminal station from erosion and landslip; surface water; groundwater; stone resources; coal resources; natural hazards (e.g. earthquakes); dry land salinity; soil and groundwater contamination; and acid sulfate soils are considered to be low and manageable. This conclusion is subject to the results of the site investigations recommended in Section 6.10.

8.0 IMPORTANT INFORMATION

Your attention is drawn to the document 'Important information relating to this report' which is included in Appendix C of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be

used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

Signature Page

Golder Associates Pty Ltd

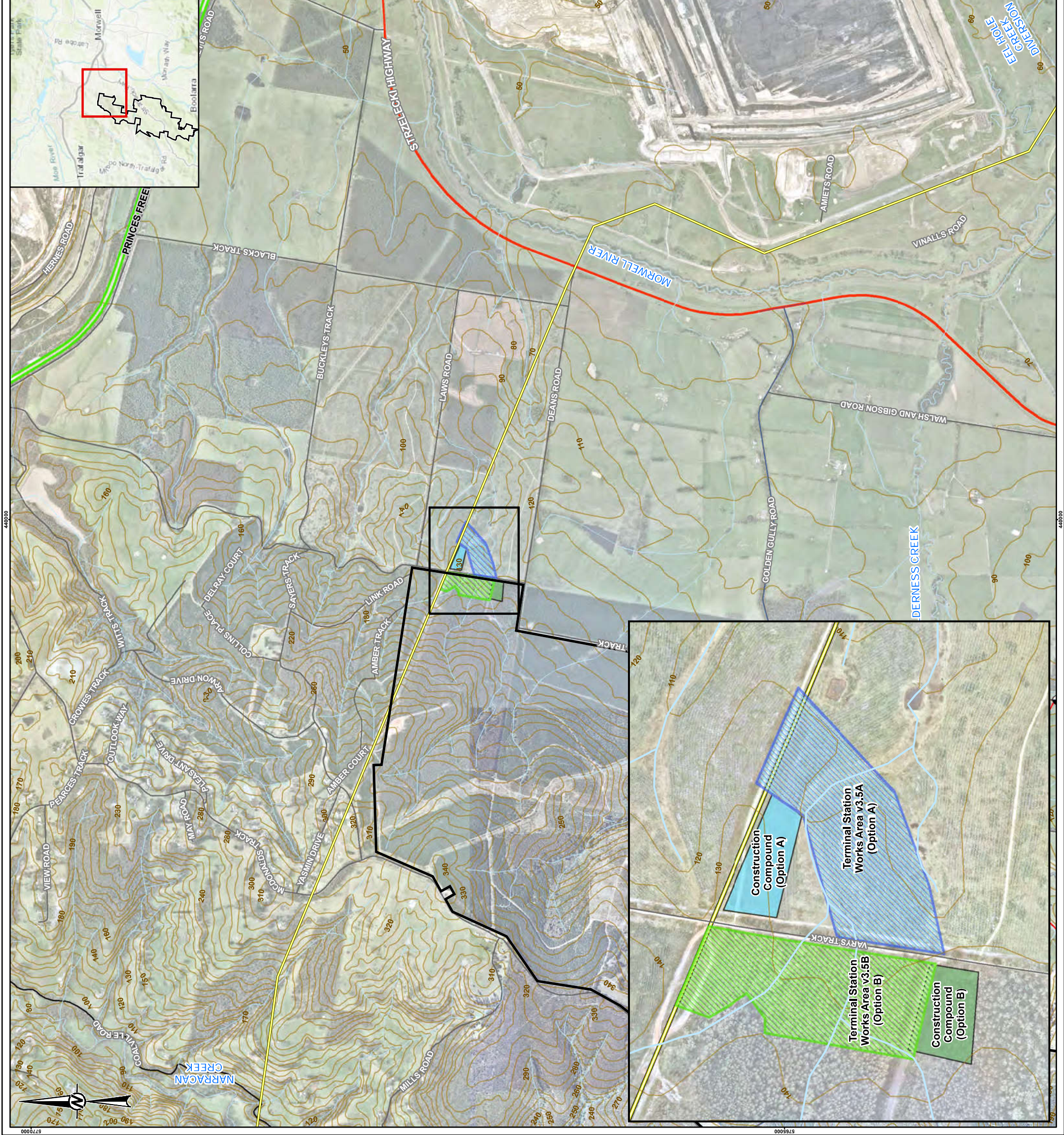
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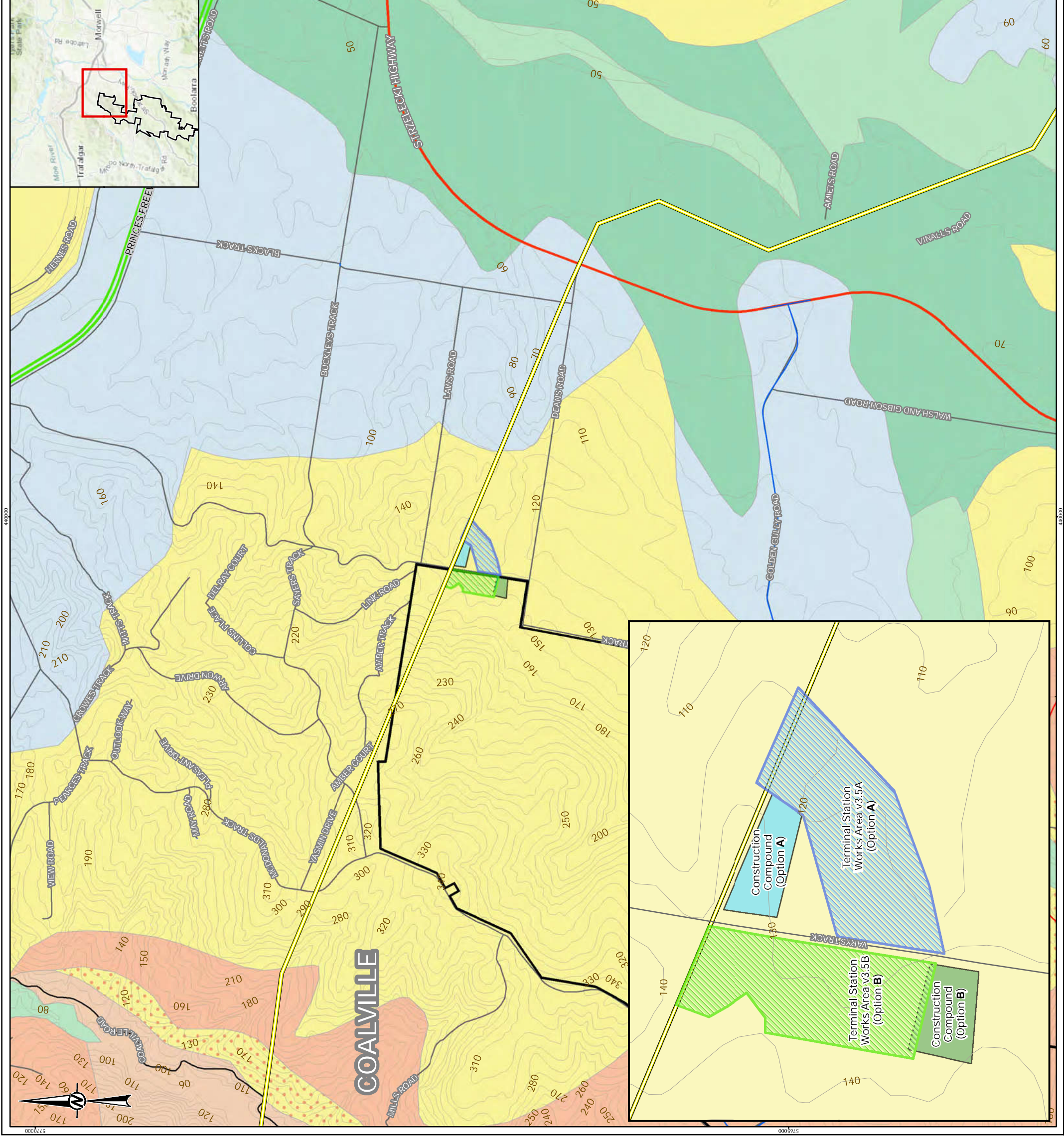
Darren Paul
Principal

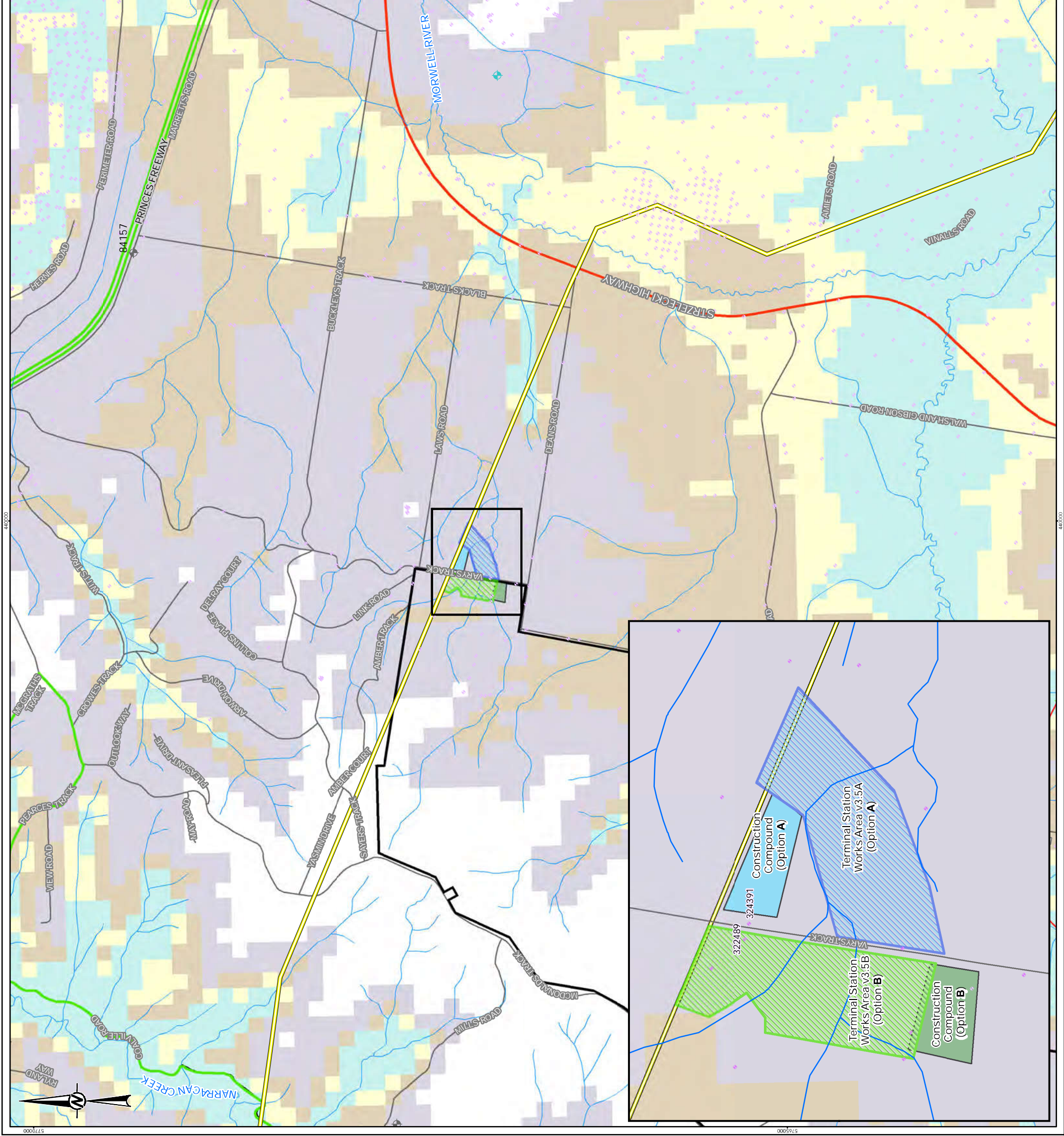
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[https://golderassociates.sharepoint.com/sites/115925/project files/6 deliverables/19130636-005-r/19130636-005-r-rev0.docx](https://golderassociates.sharepoint.com/sites/115925/project%20files/6%20deliverables/19130636-005-r/19130636-005-r-rev0.docx)







LEGEND

- Registered Wells

 - Unknown
- Use Type

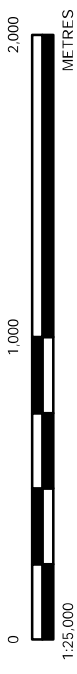
 - Stock/Domestic
 - Irrigation
 - Dairy
 - Investigation/Observation
 - Dewatering
 - SEC
- ProjectBoundary

 - Groundwater Management Areas
 - Watercourse
- Roads

 - Freeway
 - Highway
 - Local Road
 - Sealed Road
 - Other Road
 - Track
- Depth to groundwater (m)

 - 0 - 5
 - 5 - 10
 - 10 - 20
 - 20 - 50
 - >50
- Proposed Terminal Station Options

 - Terminal Station Works Area - Option A
 - Construction Compound - Option A
 - Terminal Station Works Area - Option B
 - Construction Compound - Option B
 - 220 kV High Voltage Line



NOTES

1. PROJECTION: GDA 1994 MGA ZONE 55.

REFERENCE(S)

1. ROAD & PROPERTY DATA © THE STATE OF VICTORIA, DEPARTMENT OF ENVIRONMENT, LAND, WATER & PLANNING, 2017.

2. PROPOSED TERMINAL STATION OPTIONS PROVIDED BY CLIENT.

CLIENT

DELBURN WIND FARM PTY. LTD.

PROJECT

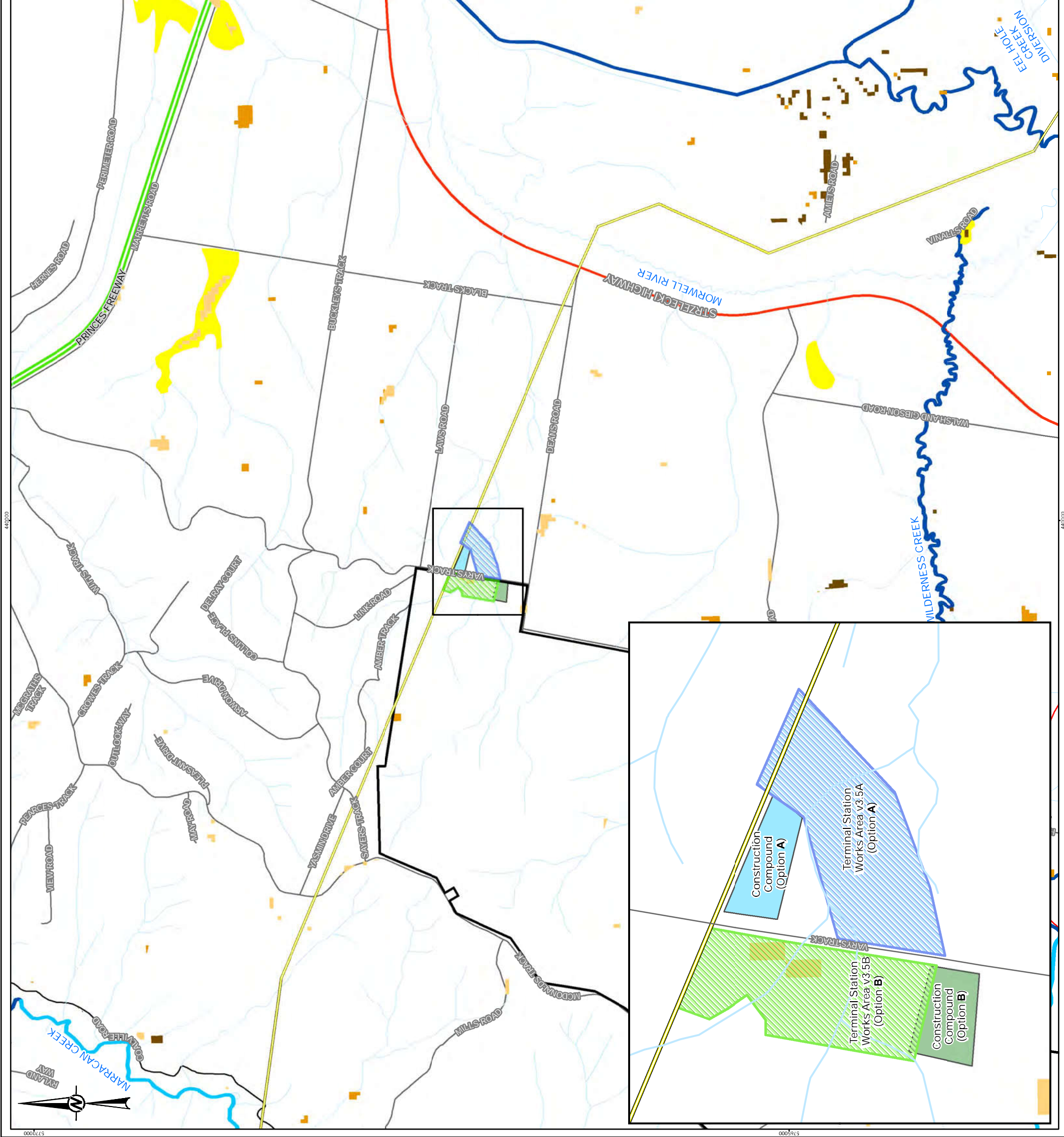
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TITLE

DEPTH TO GROUNDWATER AND REGISTERED WELLS

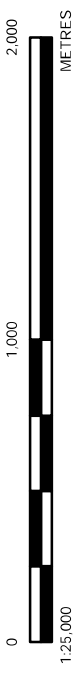
CONSULTANT	YYYY-MM-DD	2020-10-15
DESIGNED		-
PREPARED	MAH	
REVIEWED	DRP	
APPROVED	DRP	





LEGEND

- Project Boundary
- Terrestrial GDEs
 - High potential GDE
 - Moderate potential GDE
 - Low potential GDE
- Aquatic GDEs
 - High potential GDE
 - Moderate potential GDE
 - Unclassified potential GDE
- Watercourse
- Roads
 - Freeway
 - Highway
 - Local Road
 - Sealed Road
 - Other Road
 - Track
- Proposed Terminal Station Options
 - Terminal Station Works Area - Option A
 - Construction Compound - Option A
 - Terminal Station Works Area - Option B
 - Construction Compound - Option B
 - 220 kV High Voltage Line



NOTE(S)
1. PROJECTION: GDA 1994 MGA ZONE 55.

REFERENCE(S)
1. ROAD & PROPERTY DATA © THE STATE OF VICTORIA, DEPARTMENT OF ENVIRONMENT, LAND, WATER & PLANNING, 2017.
2. PROPOSED TERMINAL STATION OPTIONS PROVIDED BY CLIENT.

CLIENT
DELBURN WIND FARM PTY. LTD.

PROJECT
DESKTOP ASSESSMENT OF GEOTECHNICAL,
CONTAMINATED LAND AND HYDROLOGICAL CONSTRAINTS
TITLE
GROUNDWATER DEPENDENT ECOSYSTEMS

CONSULTANT	YYYY-MM-DD	2020-10-15
DESIGNED		-
PREPARED	MAH	
REVIEWED	DRP	
APPROVED	DRP	



PROJECT NO. CONTROL
19130636 005-R

REV. 0

FIGURE 4

445030

445030

575000

575000

APPENDIX A

Results of Desktop Study

DESKTOP STUDY

The following sets out the results of the desktop study. The information gathered through the course of the desktop study has been used to inform the impact assessment which is set out in this report.

Topographic setting

The topographic setting of the site is presented on Figure 1. The following comments relate to the topography of the site:

- The proposed terminal station sites have a shallow surface gradient towards the east.
- A shallow minor tributary to the Morwell River flows towards the east through both sites. There are two drainage courses on the Option B site, with a confluence between the Option A and Option B sites.
- Varys track which runs between the two sites is an unsealed roadway. There are numerous forestry roads which pass through and around the sites.
- An existing 220kV transmission line runs WNW to ESE to the immediate north of the sites, noting that this is the line which is proposed for connection to the terminal station.
- Both sites are currently used for logging purposes.

Geology and subsurface materials

Regional geology

The 1:63,360 scale geological mapsheet for Mirboo North (GSV, 1967, see Figure 2) shows the surface geology in the broader project area to consist primarily of Tertiary (Oligocene) age Thorpdale Volcanics (formally Thorpdale Volcanic Group), described on the mapsheet as comprising basic lava flows, plugs, dykes and pyroclastics, along with interbedded bands of clay and coal. Limited areas of outcropping Tertiary (Oligocene) age Childers Formation have been recorded beneath the Thorpdale Volcanics near the centre of the project area. The Childers Formation consists of sand, clay, conglomerate, gravel, quartzite and thin brown coal seams. The Tertiary (Pliocene to Miocene) age Latrobe Valley Group is mapped in the north and south of the project area, interbedded with the Thorpdale Volcanics and Childers Formation. Minor areas of Quaternary aged alluvium are mapped within creek channels. Basement rock beneath the site is expected to be of the Cretaceous age Wonthaggi Formation, although this is not mapped as outcropping within the project area. This is composed of sandstone and siltstone with minor conglomerate and black coal.

Site geology

With reference to Figure 2, the proposed terminal station is expected to be underlain by the Pliocene to Miocene age Latrobe Valley Group, which is described on the geological map as sand, silt, gravel and ferruginous sand, interbedded with sand and clay in varying proportion. This unit also hosts coal seams. The Unit 2 Latrobe Valley Group shows some evidence of weathering, including ferruginisation, whereby there is some cementation of sand by iron oxides and occasional very high strength ferricretes.

Localised Quaternary alluvium could be present around water courses. There are drainage courses through the proposed terminal station sites and although geological maps do not indicate the presence of alluvium it could potentially be present under both sites.

There could also be local areas of uncontrolled (i.e. non-engineered) fill associated with past activities on the site including works associated with logging activities.

Two SEC boreholes drilled on the proposed terminal station sites in 1956 (bore 322489) and 1980 (bore 324391) indicate the subsurface materials to comprise:

- Sandy soil to 0.6 m over;
- Clayey soil from 0.6 m to 18.7 m with occasional ironstone bands, over;
- Coal from 18.7 m to 37.5. The coal is described as part of the Morwell 1 seam.

Groundwater

Aquifer units

The main hydrostratigraphic units in the project area and their properties are summarised in Table A1.

Table A1: Summary of regional hydrogeological units

Unit	Thickness (m)	Aquifer type	Typical salinity (TDS, mg/L)	Typical bore yield (L/s)
Thorpdale Volcanics	Up to 60	Unconfined and confined fractured basalt aquifer	Less than 1,000	Variable, less than 4
Childers Formation	40 to 50	Confined sand aquifer	Less than 1,000	Less than 5
Latrobe Valley Group	> 100	Sand and gravel aquifers locally confined by interbedded coal and clay	Less than 900	Up to 150
Wonthaggi Formation	> 100	Fractured rock aquifer	1,000 to 3,500	Less than 5

Sources:

Nott, 2004. Groundwater Occurrence in the Gippsland Basin. Department of Sustainability and Environment, Note No. 5.

Lahey & Tickell, 1980. Explanatory Notes on the Western Port Groundwater Basin 1:100 000 Hydrogeological Map. Geological Survey of Victoria, Report #69.

Australian Stratigraphic Units Database. <https://asud.ga.gov.au/search-stratigraphic-units/>

Groundwater levels

Groundwater levels in the project area estimated as part of state-wide mapping of groundwater levels as part of the Victorian Aquifer Framework are shown in Figure 3. This indicates that depth to groundwater at the proposed terminal station is likely to be between 20 m and 50 m below current ground surface.

A search of registered boreholes on the Water Management Information System (WMIS) maintained by the Department of Environment, Land, Water and Planning (DELWP) was undertaken to identify the monitoring wells for which long term groundwater level monitoring data may be available. Two monitoring wells with groundwater level information (IDs 110731 and 79784) were identified within 5 km of the broader DWF site. The groundwater levels observed in these bores are shown in Plate A1, along with the rainfall residual mass curve. Rainfall data was obtained from the Mirboo North Water Board weather station (BOM station #85282).

Bore 110731, located approximately 4 km to the south of the proposed terminal station, is recorded as 200 m deep, but the screened interval and lithology is not reported. Based on the surface geology and depth, this bore is likely to intersect the Latrobe Valley Group, and is assumed to be the most relevant well to the proposed terminal station site. A declining in groundwater level of approximately 9 m was recorded between 1982, when the well was installed, and 2000. Groundwater level then remained relatively stable from 2000 to 2012, declined by approximately 4 m from 2012 to 2013, then remained relatively stable to 2018. The most recent groundwater level recorded (August 2018) indicates a depth to water of approximately 62 m, corresponding to an elevation of approximately 30 m AHD.

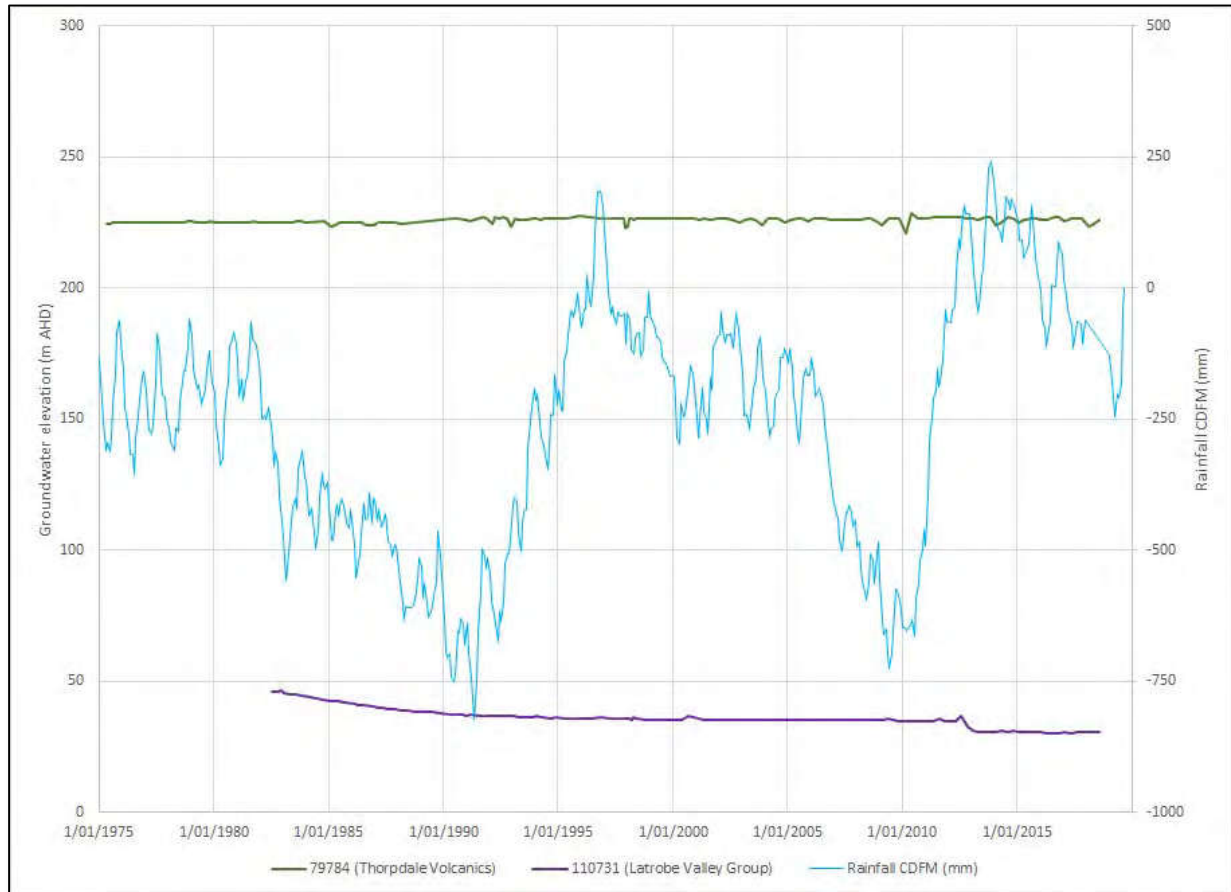


Plate A1: Groundwater level at registered wells

Groundwater flow system and receptors

Surface topography is commonly inferred to be a good indication of a water-table aquifer flow system. Local flow towards streams would be expected, with regional flow at the site to the east towards the Morwell River. The Morwell River and its tributaries, one of which passes through the proposed terminal station site fall within the Central Foothills and Coastal Plains Segment under the State Environment Protection Policy (SEPP Waters) (2018). Waterways within this segment are considered to be slightly to moderately modified, so a 95% level of protection applies when selecting water quality objectives.

A low potential terrestrial groundwater dependent ecosystem is mapped (BOM Groundwater Dependent Ecosystems Atlas) on a small portion of the Option B site as indicated in Figure 4. This area has the potential for vegetation to be reliant on sub-surface groundwater. Notwithstanding this, much of the GDE mapping is based on remote sensing data, and would require confirmation on the ground.

Regionally, groundwater levels and flow within the Latrobe Valley Group aquifers are known to be influenced by dewatering of the Latrobe Valley coal mines (SRW, 2012). The Morwell open cut is located approximately 4 km to the east of the proposed terminal stations, beyond the Morwell River and ground water underlying the site is expected to be influenced by the coal mine.

Groundwater quality

State-wide mapping indicates shallow groundwater in the project area is likely to have salinity of less than 1,000 mg/L.

A review of information on groundwater quality in the project area was undertaken using the information provided in the WMIS database. The nearest well to the proposed terminal station with available data is well 84157 which is located approximately 3 km to the north of the site as shown on Figure 3. A summary of the available data is provided in Table A2. The data indicates non-aggressive groundwater conditions, with reference to AS2159-2009: Exposure classification for steel or concrete piles. However, as the well is not located on the site and the data dates from the 1970's, it is recommended to confirm groundwater chemistry on the site if structures are likely to intersect groundwater.

Table A2: Summary of chemistry results from registered wells

Well ID	pH	EC (μ S/cm)	Total Soluble Salts (mg/L)	Chloride (mg/L)	Sulphate (mg/L)
84157	8.0	795	-	117	-

Earthquake

A review of earthquake epicentre records on the Geovic website indicates there have been earthquakes with magnitude up to 5.4 within about 12 km to the southwest of the proposed terminal stations. Figure 3.2(A) of Australian Standard AS1170.4 – 2007 'Structural design actions Part 4: Earthquake actions in Australia' indicates that the hazard factor (z) for the site is 0.11.

Landslide and slope instability

Review of the digital terrain model by a principal engineering geologist has been undertaken to identify areas within the broader wind farm development that appear to have been subject to previous slope instability. The site of the proposed terminal station is on relatively flat land and was not assessed as having susceptibility to landslide or slope instability.

Sites of geological significance

The GeoVic website does not identify any sites of geological significance within the project boundaries.

Mineral Resources

The Department of Primary industries, Victorian Coal Inventory of Resources, 31 August 2007, (ref: GHD 31/20049/7979) indicates the site is underlain by coal resources. Exploratory boreholes drilled on the site of

the proposed terminal station by the State Electricity Commission (SEC) in 1956 (Borehole 322489) and 1980 (Borehole 324291) indicate the Morwell 1 coal seam is present below the site between depths of about 19 m and 38 m.

Acid sulfate soils

The CSIRO Acid Sulfate Soils Probability map indicates the site to have an “extremely low probability of occurrence” for acid sulfate soils.

Surface hydrology

The GeoVic website indicates that the site of the proposed terminal station is not located within a designated water supply catchment area. The terminal station site does not appear to be within any declared water supply catchment or groundwater water supply protection areas.

Historical aerial photographs

Commercially available historical aerial photographs were obtained for review of the broader wind farm site. The observations from the review are summarised in Table A3 and copies of the historical aerial photographs are provided in Appendix B.

Table A3: Aerial photograph observations

Date of Photograph Run	Notes
1945	The available photograph only covers the central northern portion of the site and does not include the terminal station site. This portion of the site mostly consists of tree covered areas with visible paddocks and roadways across the area. Rural residential dwellings and farm sheds are scattered across the area.
1965	The site mostly consists of tree covered areas with some visible paddocks and roadways. Inferred cropping is evident in the south of the site. The terminal station site appears to comprise open land.
1980s	The available photographs cover limited sections of the site and do not include the terminal station site. The visible areas of the site appear to be generally unchanged from the 1965 photographs.
2010s (NearMap)	The site mostly consists of tree covered areas with some visible paddocks and roadways. Some areas have been cleared of trees since the previous photographs. The terminal station site appears to be covered with a plantation.

Environmental Protection Authority database

Certificates and Statements of Environmental Audit (EPA Victoria)

Certificates and Statements of Environmental Audit are statutory documents that are issued after a statutory environmental audit of a property has been conducted. A *Certificate of Environmental Audit* is issued for property where, following an audit, an environmental auditor believes the environmental condition of the land is suitable for any beneficial use. A *Statement of Environmental Audit* is issued where, following an audit, an environmental auditor believes the land is not suitable for all possible beneficial uses, but is suitable for specific uses or developments; it may contain conditions of clean-up or management of contamination.

A search of the EPA Victoria 'List of Issued Certificates and Statements of Environmental Audit' and Visualising Victoria's Groundwater website did not identify any completed environmental audits within 1 km of the site.

The closest environmental audit to the site boundary is located approximately 7 km east north east from the proposed terminal station site and was completed in 2002 (CARMS No. 47803-1).

Groundwater Quality Restricted Use Zones (EPA Victoria website)

A groundwater quality restricted use zone (GQRUZ) is an EPA declared area where, following an environmental audit, groundwater pollution remains, usually as a result of previous industrial activity. A GQRUZ is implemented when attempts have been made to clean up the groundwater and EPA determines that restrictions should remain on how the water can be used without further treatment.

A search of Visualising Victoria's Groundwater website indicates there are no GQRUZs within 1 km of the site.

EPA Priority Sites Register (EPA Victoria)

The Priority Sites Register lists sites for which the EPA has issued a Clean-Up Notice (CUN) or a Pollution Abatement Notice (PAN) pursuant to sections of the *Environment Protection Act 1970*. The condition of these sites is not compatible with the current or approved use of the site without active management to reduce the risk to human health and the environment. Such management can include clean-up, monitoring and/or institutional controls.

The Priority Sites Register (current to 30 September 2019) does not list the site, or any site within 1 km of the site.

Post Closure Pollution Abatement Notices

Following closure, landfills continue to pose risks to the environment. In order to ensure that the risks are appropriately quantified and managed, owners of closed landfill sites are issued with a Post Closure Pollution Abatement Notices (PC PAN) that requires the closed landfill to be managed so there are no unacceptable risks to the environment.

EPA Victoria maintains a database for locating issued PC PAN documents (EPA Interaction Portal). The database was queried 28 October 2019 and did not list any PC PANs within the townships/localities (Boolarra, Darlimurla, Delburn, Driffield, Hernes Oak, Narracan and Yinnar) that are within the region of the site.

Victorian Landfill Register

Publicly available to all Victorians, the Victorian Landfill Register (VLR) draws information from various sources. It lists all current and known closed landfills in Victoria. Information contained in the VLR is intended to be used only as a guide and is not to be relied upon as being either complete or accurate. The VLR brings together information from:

- EPA landfill licences and post closure pollution abatement notices;
- Regional Waste and Resource Recovery Implementation Plans; and
- Historic landfill records held by EPA.

Sites that are located within 500 m of landfills, or former landfills may require further assessment for potential ground gas risks, such as methane.

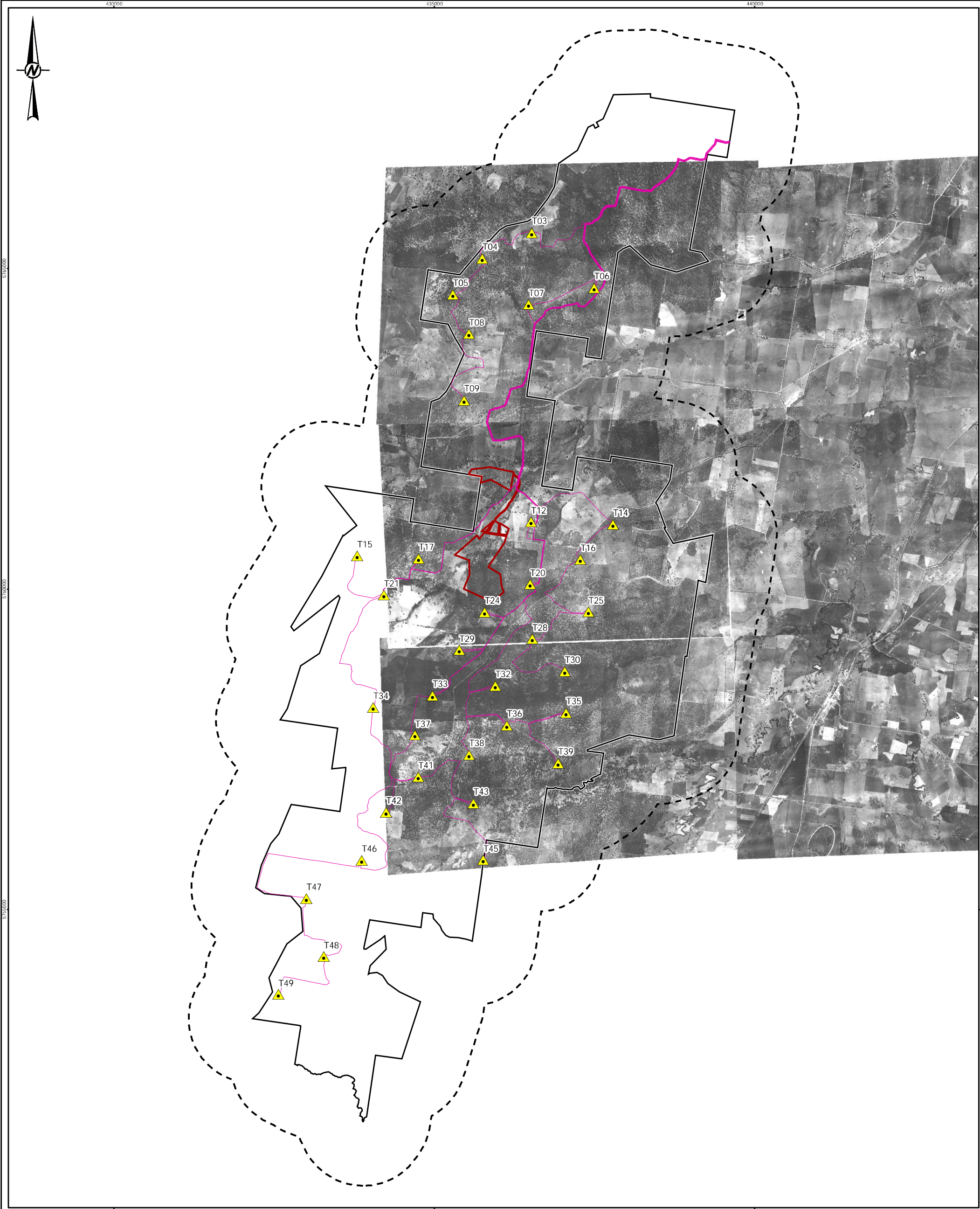
The VLR interactive webpage was queried on 1 September 2020 and shows one closed landfill located about 4 km to the north of the site (at its closest point) which is operated by Latrobe City Council. No other landfills were listed on the register within a 1 km radius of the site.

An interest search of Energy Australia Yallourn Pty Ltd found that Energy Australia Yallourn submitted a Financial Assurance proposal to the Victorian EPA for three operational landfills located at Yallourn. The three landfills include an ash landfill, a hard waste landfill and an asbestos landfill. The Financial Assurance Proposal was approved by EPA in December 2018.

Additionally, the VLR interactive webpage shows that an operational landfill is located at the Hazelwood Power Complex and receives ceramic-based fibres, asbestos and ash waste, the landfill is located approximately 1.7 km south east of the site at its closest point.

APPENDIX B

Historical Aerial Photographs

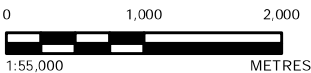


- LEGEND
- WTG Location
 - Reticulation
 - Kennedy Quarry
 - Project Boundary
 - Project Boundary (1km buffer)

DRAFT

NOTE(S)
1. PROJECTION: GDA 1994 MGA ZONE 55

REFERENCE(S)
1. IMAGERY SOURCED FROM GOLDER ARCHIVES.



CLIENT
OSMI AUSTRALIA

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REVIEWED	JMW
APPROVED	JMW

PROJECT
DESKTOP ASSESSMENT OF GEOTECHNICAL, CONTAMINATED
LAND AND HYDROLOGICAL CONSTRAINTS

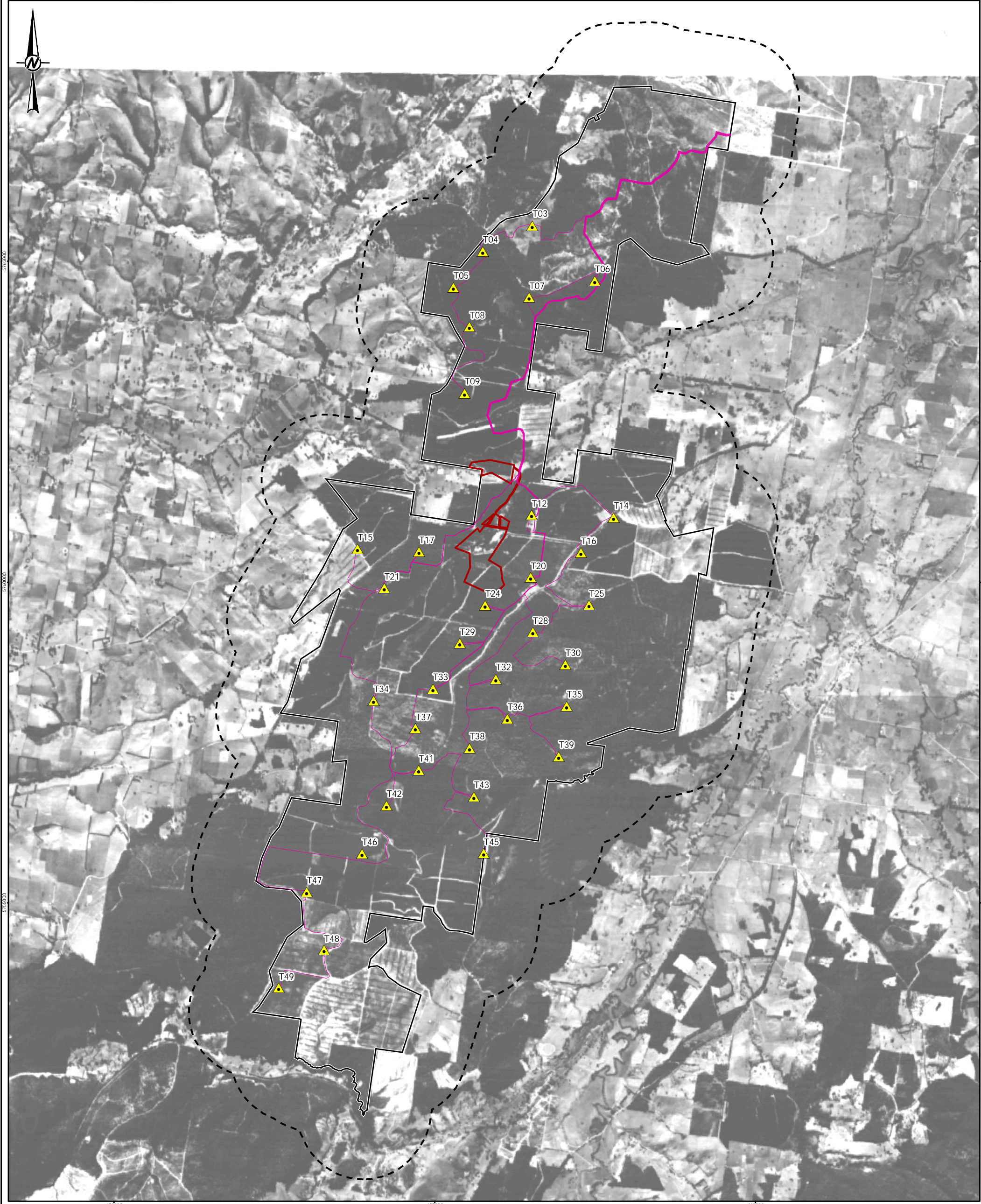
TITLE
1945 AERIAL

PROJECT NO.
19130636

CONTROL
001

REV.
A

FIGURE
B1

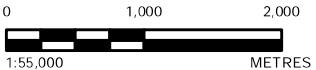


- LEGEND
- WTG Location
 - Reticulation
 - Kennedy Quarry
 - Project Boundary
 - Project Boundary (1km buffer)

DRAFT

NOTE(S)
1. PROJECTION: GDA 1994 MGA ZONE 55

REFERENCE(S)
1. IMAGERY SOURCED FROM GOLDER ARCHIVES.



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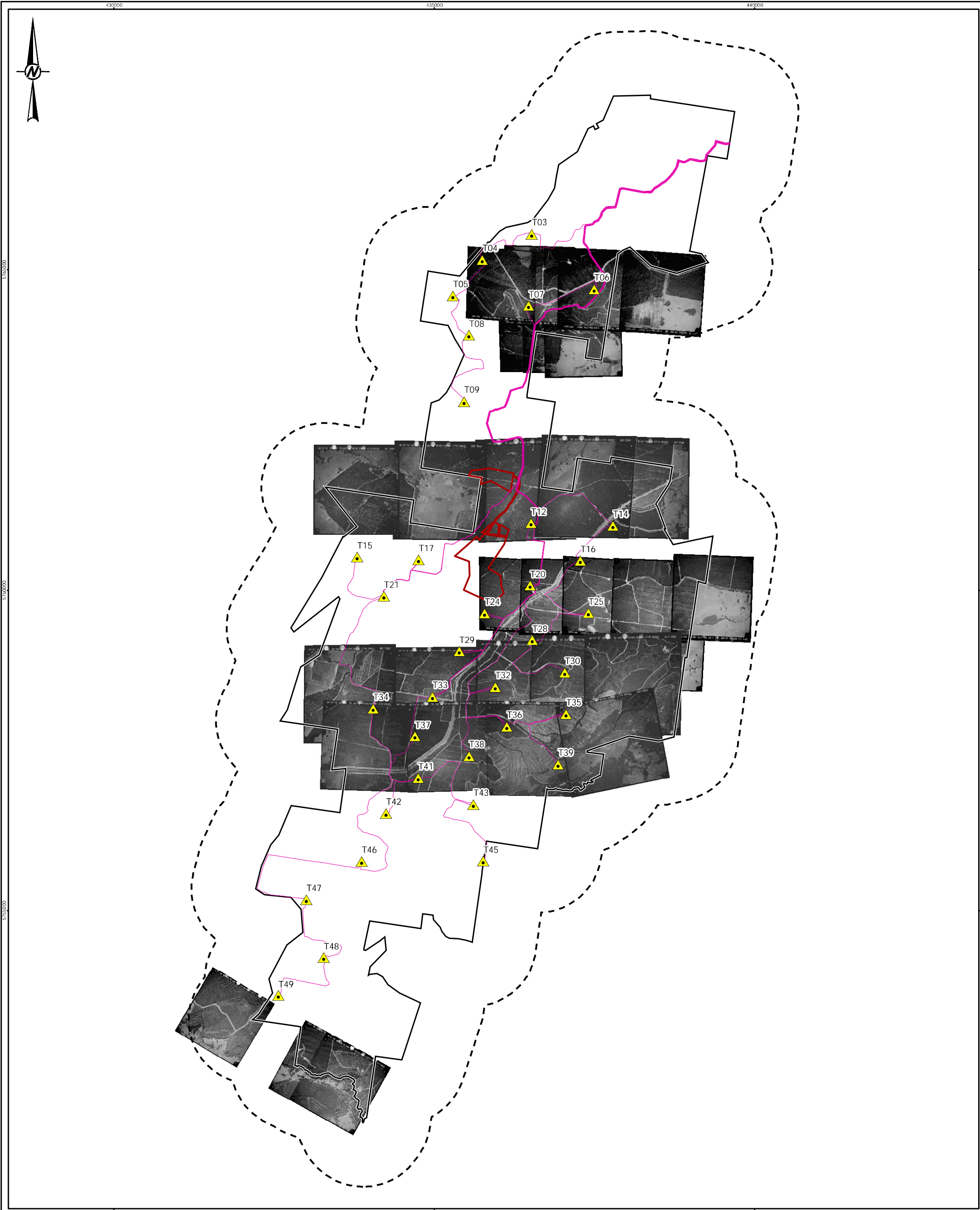
CONSULTANT	YYYY-MM-DD	2019-11-07
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	REVIEWED	JMW
	APPROVED	JMW



PROJECT
DESKTOP ASSESSMENT OF GEOTECHNICAL, CONTAMINATED
LAND AND HYDROLOGICAL CONSTRAINTS

TITLE
1965 AERIAL

PROJECT NO. 19130636	CONTROL 001	REV. A	FIGURE B2
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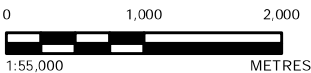


- LEGEND
- WTG Location
 - Reticulation
 - Kennedy Quarry
 - Project Boundary
 - Project Boundary (1km buffer)

DRAFT

NOTE(S)
1. PROJECTION: GDA 1994 MGA ZONE 55

REFERENCE(S)
1. IMAGERY SOURCED FROM GOLDBER ARCHIVES.



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OSMI AUSTRALIA

CONSULTANT	YYYY-MM-DD	2019-11-07
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	APPROVED	JMW



PROJECT
DESKTOP ASSESSMENT OF GEOTECHNICAL, CONTAMINATED
LAND AND HYDROLOGICAL CONSTRAINTS

TITLE
1980 AERIAL

PROJECT NO.	CONTROL	REV.	FIGURE
19130636	001	A	B3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM 150x110 TO 150x110

APPENDIX C

**Important information relating to
this report**



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